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PTO/SB/16 (10-01)
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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

Express Mail Label No. EV 032 108 220 US

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
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☒ *Additional inventors are being named on the 2 separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

Haptic Messaging in Handheld Devices

CORRESPONDENCE ADDRESS

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages* 13 ☐ CD(s), Number

☒ Drawing(s) *Number of Sheets* 4 ☐ Other (specify)

☐ Application Data Sheet. See 37 CFR 1.76

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☐ Applicant claims small entity status. See 37 CFR 1.27.

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Respectfully submitted,

SIGNATURE John C. Alemanni

TYPED or PRINTED NAME John C. Alemanni

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Date 12-08-02

REGISTRATION NO. (*if appropriate*) 46,384

Docket Number: IMM152P

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Docket Number	IMM152P

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Number 2 of 2

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Express Mail No. EV 032 108 220 US
Docket No. IMM152P

PROVISIONAL PATENT APPLICATION OF

Shoichi Endo, Jeffrey Eid, Dean Chang, and Erik Shahoian

for

HAPTIC MESSAGING IN HANDHELD DEVICES

FIELD OF THE INVENTION

[0001] This invention relates generally to haptic-feedback systems. More specifically, embodiments of the present invention relate to using customized haptic effects in a variety of contexts to convey information to users of handheld communication devices.

BACKGROUND

[0002] As handheld communication devices become part of everyday life, device manufactures and service providers strive to enhance the versatility and performance of such devices.

[0003] Handheld communication devices in the art (e.g., mobile phones, pagers, personal digital assistants (PDAs), etc.) typically use auditory and visual cues to alert a user when incoming messages, such as voice calls and emails, are received. Such auditory and visual alerts, however, have the disadvantages of being distracting in some situations (e.g., during driving), or annoying in others (e.g., during a meeting or a concert). Although vibratory alerts are also made available in some communication devices such as cellular phones, the vibratory effects that can be generated act in a "one-size-fitting-all" fashion for a given device, as opposed to being customized according to applications, thus conveying very little information about the source of the alert. A need

exists therefore in the art, for delivering information to users of handheld communication devices in a manner that overcomes the aforementioned shortcomings. There would be a further advance in the art to provide a new sensory modality in handheld devices.

SUMMARY

[0004] Embodiments of the invention relate to methods and systems for providing "haptic messaging" to users of handheld communication devices in a customized (or personalized) manner.

[0005] In one embodiment, a method of haptic messaging comprises: determining the source of a call event; selecting a predetermined signal based on the determination, the predetermined signal configured to correlate with a haptic effect; and outputting the haptic effect to a handheld device.

[0006] The method also includes supplying a collection of haptic effects, each correlating with a predetermined signal; and mapping each call event to one of the haptic effects (e.g., by way of its source). The one-to-one mappings between various call events of interest and corresponding haptic effects can be further compiled into a "haptic lookup table."

BRIEF DESCRIPTION OF THE FIGURES

[0007] These and other features, aspects, and advantages of the present invention are better understood when the following Detailed Description is read with reference to the accompanying drawings, wherein:

FIG. 1 shows a flowchart depicting a method of haptic messaging in a handheld device, according to one embodiment of the present invention;

FIG. 2 depicts a haptic handheld device according to one embodiment of the present invention;

FIG. 3 is a flowchart illustrating a process of providing a remote haptic effect in one embodiment of the present invention; and

FIG. 4 is a flowchart illustrating a process for providing haptic effects to a remote control in one embodiment of the present invention.

DETAILED DESCRIPTION

[0008] FIG. 1 shows a flowchart 100 depicting a method of haptic messaging in a handheld device, according to an embodiment of the invention. It will be appreciated that the embodiment of FIG. 1 is provided by way of example to illustrate the principles of the invention, and should not be construed as limiting the scope of the invention in any manner. One skilled in the art would also recognize that various changes and modifications can be made herein, without departing from the principles and scope of the invention.

[0009] The flowchart 100 of FIG. 1 comprises determining a source of a call event, as recited in step 110; selecting a predetermined signal based on the determination, the predetermined signal configured to correlate with a haptic effect, as recited in step 120; and outputting the haptic effect to a handheld device, as recited in step 130.

[0010] In the embodiment of FIG. 1, the term "call event" comprises any message that conveys information to the user of a handheld device. Examples of call event include an incoming message, such as a voice call, an email, a text message (e.g., an "instant message" as known in the art), or a virtual touch indicator/signal. Examples of

call event can also include a self-generated message, such as a reminder for a pre-scheduled activity (e.g., an appointment or a show). The "source" relates to a characteristic that distinctly identifies (or characterizes) a call event, such as the caller's phone number, the sender's email address, or the type of a pre-scheduled activity. The term "selecting" includes, without limitation, looking up a predetermined mapping between the call event at play and a corresponding haptic effect, and selecting/generating a predetermined signal that is configured to render the desired haptic effect (e.g., upon being applied to an actuator).

[0011] The flowchart of FIG. 1 includes supplying a collection of haptic effects, each correlating with a predetermined signal, as recited in step 140. Underlying this collection of haptic effects can be a software code (e.g., stored in a memory on the handheld device) that is devised to generate the corresponding predetermined signals (e.g., each characterized by a distinct waveform) rendering these haptic effects. A user can map each call event to one of the stored haptic effects (e.g., by way of its source), as recited in step 150 of FIG. 1. And the one-to-one mappings made between various call events of interest and the corresponding haptic effects can be compiled into a "haptic lookup table" (e.g., stored in a memory on the handheld device), as recited in step 160. The "selection" recited in step 120 can be made based upon this haptic lookup table, for instance.

[0012] As such, each call event is accompanied by a distinct haptic effect, conveying to the user customized information such as "who is calling," "what is happening," and so on. The user can also be allowed to update the "haptic lookup table," e.g., to include new call events, and/or to modify the mappings between the existing call events and corresponding haptic effects.

[0013] In the above, the term "handheld communication device" (or "handheld device") includes a mobile phone such as a cellular phone or a satellite phone (e.g., a "Blackberry" as known in the art), a PDA, a pager, a handheld (or portable) computer, a gamepad, or other handheld devices known in the art that are equipped with communication (or networking) capabilities.

[0014] In one embodiment, the aforementioned haptic effects can serve as "haptic ringers" (e.g., "counterparts" to auditory ring tones), to inform the user of events such as incoming voice calls and emails. Such haptic ringers can be customized (or personalized) according to caller phone numbers and/or sender's email addresses, so as to allow the user to identify the source of an incoming message. As a way of example, a haptic ringer associated with a call from a loved one (e.g., the user's mother) may comprise low-amplitude and high frequency vibrations that impart "gentle" sensations to the user. In contrast, a haptic ringer for a "911" call may comprise "jolt-like" pulses that impart "pounding" sensations to the user. Haptic ringers can also be customized to inform the user of self-generated events such as pre-scheduled activities, e.g., by way of the activity type (whether it be a business meeting or a favorite TV program, for instance).

[0015] In contrast with conventional auditory ring tones, the aforementioned haptic ringers are more desirable in an environment where extraneous auditory signals are prohibited (e.g., during a meeting or a concert), and/or where it is difficult to distinguish auditory signals (e.g., in a loud environment such as an airport). The haptic ringers are also more suitable in a situation such as driving, so that the user of a handheld device can keep eyes on the road without having to look at the device. Moreover, such haptic

ringers convey customized information to the user, so that the user is aware of "who is calling," "what is happening," and so on.

[0016] Embodiments of the present invention include the following:

[0017] Examples

[0018] In one embodiment, the individual's telephone (cellular or otherwise) includes e-mail capability (both receive and send). The telephone also includes hardware and software that provides a third distinctive vibration -- different from the first two mentioned above -- when an e-mail is received from the e-mail address of the individual's brother. It further includes hardware and software that provides a fourth distinctive vibration -- different from the first three mentioned -- when an e-mail is received from the e-mail address of the individual's top client if the e-mail contains the "smiley-face" emoticon :). The fourth distinctive vibration is a short haptic effect of higher magnitude, meant to emulate a "high five." The individual programs the telephone by inputting the respective e-mail addresses and selecting a vibration to use with each. When calls are subsequently received, the telephone provides the effect.

[0019] In another embodiment, the individual is in a movie theater, watching a movie, and has the telephone in the individual's pocket. It is set not to make any noise, since the user is in the theater. While the individual is watching the movie, the individual's telephone vibrates with the second vibration. The individual chooses to ignore the call, because the individual does not wish to speak with anyone at the individual's place of employment. Later, the individual's telephone vibrates with the first vibration. The individual's wishes to speak with the individual's spouse, to make plans to

meet later, and so the individual answers the phone and quickly exits the theater to talk with the individual's spouse.

[0020] The individual's telephone includes a personal schedule calendar application. After speaking with the individual's spouse, the individual enters an entry in the calendar at the 7:00 pm time mark "Meet Cathy" (his spouse). The individual also chooses a fifth distinctive vibration -- different from the first four mentioned -- to associate with the calendar entry. The telephone is programmed to provide the fifth distinctive vibration fifteen minutes before the time entry of the calendar (i.e., at 6:45).

[0021] FIG. 2 depicts a haptic handheld device 200 according to an embodiment of the invention, illustrating by way of example how the embodiment of FIG. 1 can be implemented. It will be appreciated that various elements are shown in schematic form for illustrative purposes and are not drawn to scale. It will also be appreciated that there are many alternative ways of practicing the present invention. Accordingly, various changes and modifications may be made herein, without departing from the principles and scope of the invention.

[0022] By way of example, haptic device 200 may include a device body including a housing 210 and a user-interface 212; a processor 220; at least one actuator 230; and a memory 240 storing a software code to be executed by the processor 220. For purpose of illustration, the processor 220, the actuator 230, and the memory 240 are shown to be enclosed within and coupled to the device body. Such an illustration, however, should not be construed as limiting the scope of the invention in any manner. In alternative embodiments, for instance, the actuator may be coupled to the outside of the housing 210,

or embedded in the housing 210 via a suitable mechanism. Further, the user-interface 210 may contain a key pad (containing one or more keys), a touch pad or touch screen, a scroll wheel, a direction pad, a miniature joystick, and/or other user-interface means known in the art.

[0023] In the embodiment of FIG. 2, the executable software code stored in the memory 240 is configured to cause the processor 220 to perform tasks upon executing the software. More specifically, the executable software code causes the processor 220 to determine the source of a call event 250 and based on the determination, to select a predetermined signal that correlates with a haptic effect. The executable software code further causes the processor 220 to command the selected predetermined signal to the actuator 230, such that the haptic effect is rendered and output to the device body.

[0024] The memory 240 may further store code that is devised to generate a plurality of predetermined signals, each correlating with a haptic effect, such that a collection of haptic effects is made available on the handheld device. The memory 240 may also store code that enables a user to map a call event of interest to one of such haptic effects. In addition, a user may be allowed to compile the one-to-one mappings between various call events of interest and corresponding haptic effects into a "haptic lookup table," which can also be stored in the memory 240, for instance.

[0025] The selection of a predetermined signal described above may be carried out by way of looking up the aforementioned "haptic lookup table," and selecting/generating the corresponding predetermined signal that renders the desired haptic effect, upon being applied to the actuator 230.

[0026] Moreover, the executable software code may contain provisions for dealing with a call event whose source is unknown. For instance, a specific haptic effect can be designated for any unknown call event (such as a voice call or an email), so as to alert the user that the incoming message is from an un-identifiable caller (or sender).

[0027] In the above, the actuator 230 may be a pager motor, an eccentric rotating motor, a harmonic eccentric rotating motor, a voice coil, a piezoelectric actuator, an electro-active polymer actuator, or other types of active/passive actuators suitable for generating haptic (e.g., tactile and kinesthetic) effects. U.S. Patent Nos. 6,429,846 and 6,424,333 disclose further details relating to some of these actuators, both of which are incorporated in full herein by reference. It will be appreciated that in some instances, one or more actuators may be implemented in a handheld device, configured to deliver appropriate haptic effects. It will be further appreciated that various control schemes can be devised accordingly for controlling the actuator(s) in a manner that best achieves the desired haptic effects.

[0028] In one embodiment, the actuator 230 may be coupled to the housing 210, thereby imparting the haptic effects thus generated to the device body. Haptic ringers (or alerts) described above may be delivered in this manner, for instance. In another embodiment, the actuator 230 may be coupled to the user-interface 212 of the device body. For instance, an active actuator can be coupled to a scroll wheel (or a joystick) on the user-interface 212 to deliver a virtual touch (e.g., handshake) described above, as a user moves the scroll wheel (or joystick) back and forth. One or more actuators can also be coupled to a key pad (or a touch pad) on the user-interface 212 to convey a "high-five" to a user, in another instance.

[0029] The collection of haptic effects stored in a handheld device described above may include one or more for delivering remote haptic effects, including various virtual touch effects (such as "handshake" and "high-five"). FIG. 3 is a flowchart illustrating a process of providing a remote haptic effect in one embodiment of the present invention. In the embodiment shown, a call event in the form of a "virtual touch indicator" may be first transmitted to a handheld device (e.g., the haptic device 200 of FIG. 2), to inform the user that a remote user wishes to send a virtual touch such as a "handshake." The device (200) receives the call 302. A distinctive haptic ring, as described in relation to FIG. 1, may accompany the call, identifying the caller and the nature of the call. The device then answers the call, performing any necessary instantiation routines to enable the communication 304. The device (200) receives a signal in the communication that contains the code or waveform for the haptic effect 306. The device (200) provides the haptic effect 308.

[0030] For example, the haptic effect may include a "handshake." The call includes a distinctive ring, alerting the user to the fact that an effect will be forthcoming. Accordingly, the user of the device (200) maintains contact with an appropriate "touching" means such as a scroll wheel described above, and experiences the "handshake" in an interactive (or real-time) fashion.

[0031] Referring again to FIG. 3, the device (200) determines if additional effects are contained or forthcoming in the communication 310. If so, the device (200) receives the signal 306 and provides the effect 308. If not, the device (200) ends the call. It will be appreciated that in another embodiment, a "virtual touch signal" may be transmitted to the handheld device (e.g., following the virtual touch indicator), and renders the

corresponding virtual touch on the user. From the teaching of the invention, one skilled in the art can also devise other schemes for delivering virtual touch on users of handheld devices.

[0032] In another embodiment, the haptic effects of the invention can be used to provide a new dimension of sensing to users of handheld devices, such as delivering virtual touch in an interactive (or real-time) manner. For instance, kinesthetic effects can be devised to convey a virtual "handshake," a virtual "high-five," or a virtual "massage" between two users of two handheld devices in a real-time fashion. The ensuing description provides further detail in this regard.

[0033] A haptic-enabled handheld device of the invention (e.g., the embodiment of FIG. 2) may be further used as a "two-way" remote control, e.g., for controlling a remote system such as a Television set or a multimedia system. In this scenario, the "call events" as referred to above may be related to program channels shown on the remote system, each identified by a channel number (which may be used as the "source"), for instance. The corresponding haptic effects may be customized on a per-channel basis. Such haptic effects can serve to inform a user as to which channel is on, as a user is channel-surfing by way of this haptic remote control, so that the user need not to look up the display screen.

[0034] FIG. 4 is a flowchart illustrating a process for providing haptic effects to a remote control in one embodiment of the present invention. In the embodiment shown, the remote control sends a command signal to the television or other device 402. As with conventional remotes, the signal may or may not reach the device. Therefore, the remote

control then determines whether a feedback signal has been received 404. If not, the process ends. If the remote receives a feedback signal, the remote utilizes the feedback signal to determine the appropriate haptic effect to provide 406.

[0035] In one embodiment, the television or other device provides information to the remote regarding the state of the display. In such an embodiment, the remote uses the information provided to determine the effect to provide. In another embodiment, the television determines the appropriate effect to provide and sends an identifier to the remote in the feedback signal. Once the remote has determined the appropriate haptic effect to provide, the remote provides the effect 408.

[0036] An individual has a cellular telephone according to the present invention in the individual's pocket. The telephone includes programming that provides a first distinctive haptic effect (in this case, a particular vibration) when a call is received from the telephone number of the individual's spouse. The telephone also includes programming that provides a second vibration -- different and distinct from the first vibration -- when a call is received from the telephone number of the user's place of employment. The individual previous programmed the telephone by inputting the respective telephone numbers and selecting a vibration to use with each.

[0037] One embodiment of the present invention implements a method, comprising determining a source of a call event, selecting a predetermined signal based on the determination, outputting to a handheld device a haptic effect correlating to the predetermined signal. The call event may comprise, for example, a call from another party or a self-generated message. A plurality of haptic effects may be stored in a lookup

table, wherein each haptic effect is correlated to one or more predetermined signals. The effects may include a haptic ringer, a virtual touch, or other desired effect.

[0038] A device according to one embodiment of the present invention comprises a body, a user interface coupled to the body, a processor enclosed within the body, an actuator coupled to the body and configured to output haptic effects to the body, and memory enclosed within the body. The device may comprise, for example, a cellular phone, a satellite phone, a pager, a personal digital assistant, an MP3 player, a game console controller, a personal gaming device, or a personal computer. The user interface of the device comprises a scroll wheel, a plurality of buttons, or other suitable interface elements.

[0039] The foregoing description of the preferred embodiments of the invention has been presented only for the purpose of illustration and description and is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Numerous modifications and adaptations thereof will be apparent to those skilled in the art without departing from the spirit and scope of the present invention.

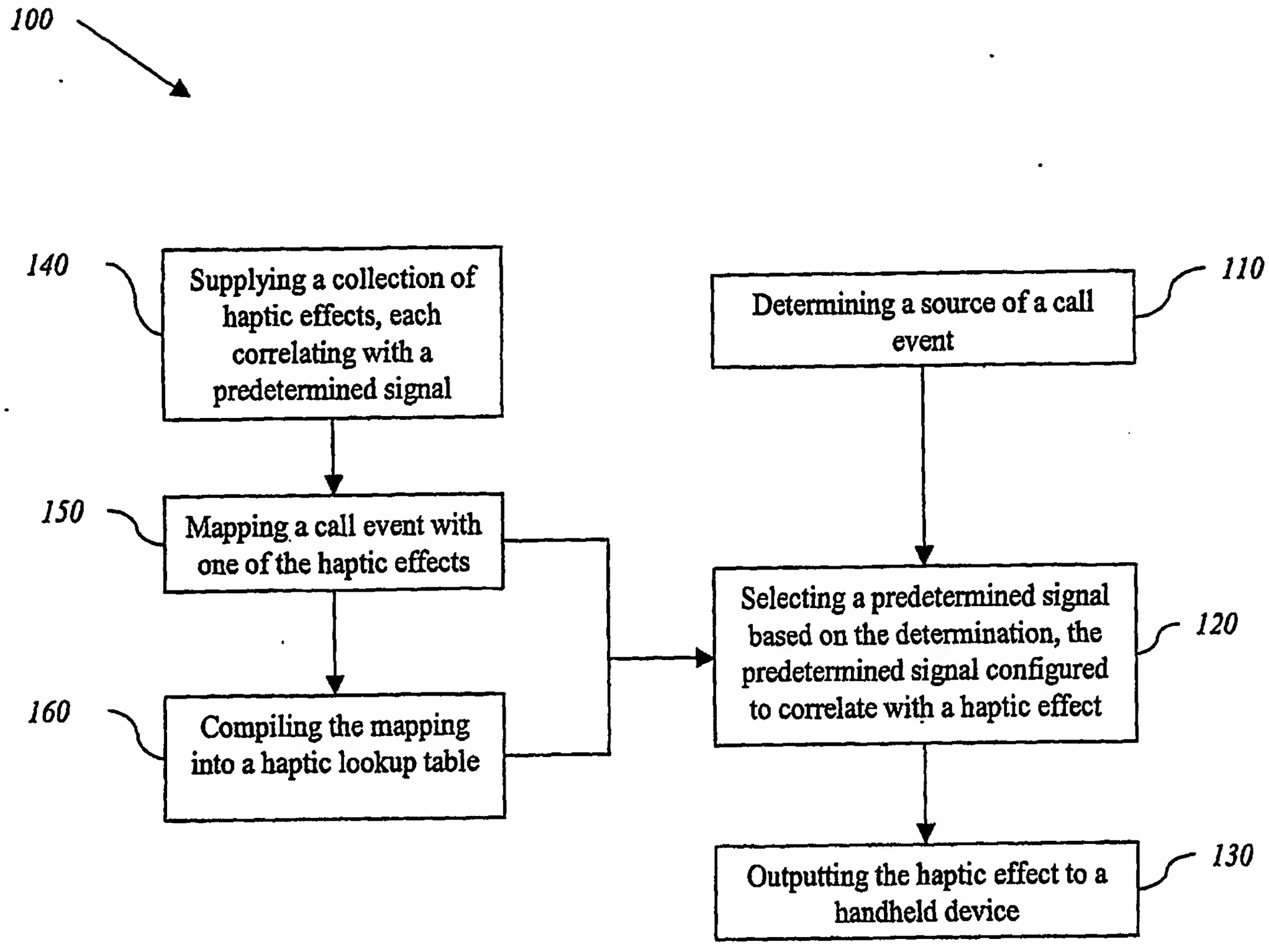
100
140
Supplying a collection of haptic effects, each correlating with a predetermined signal
150
Mapping a call event with one of the haptic effects
160
Compiling the mapping into a haptic lookup table
Determining a source of a call event
110
Selecting a predetermined signal based on the determination, the predetermined signal configured to correlate with a haptic effect
120
Outputting the haptic effect to a handheld device
130

FIG. 1

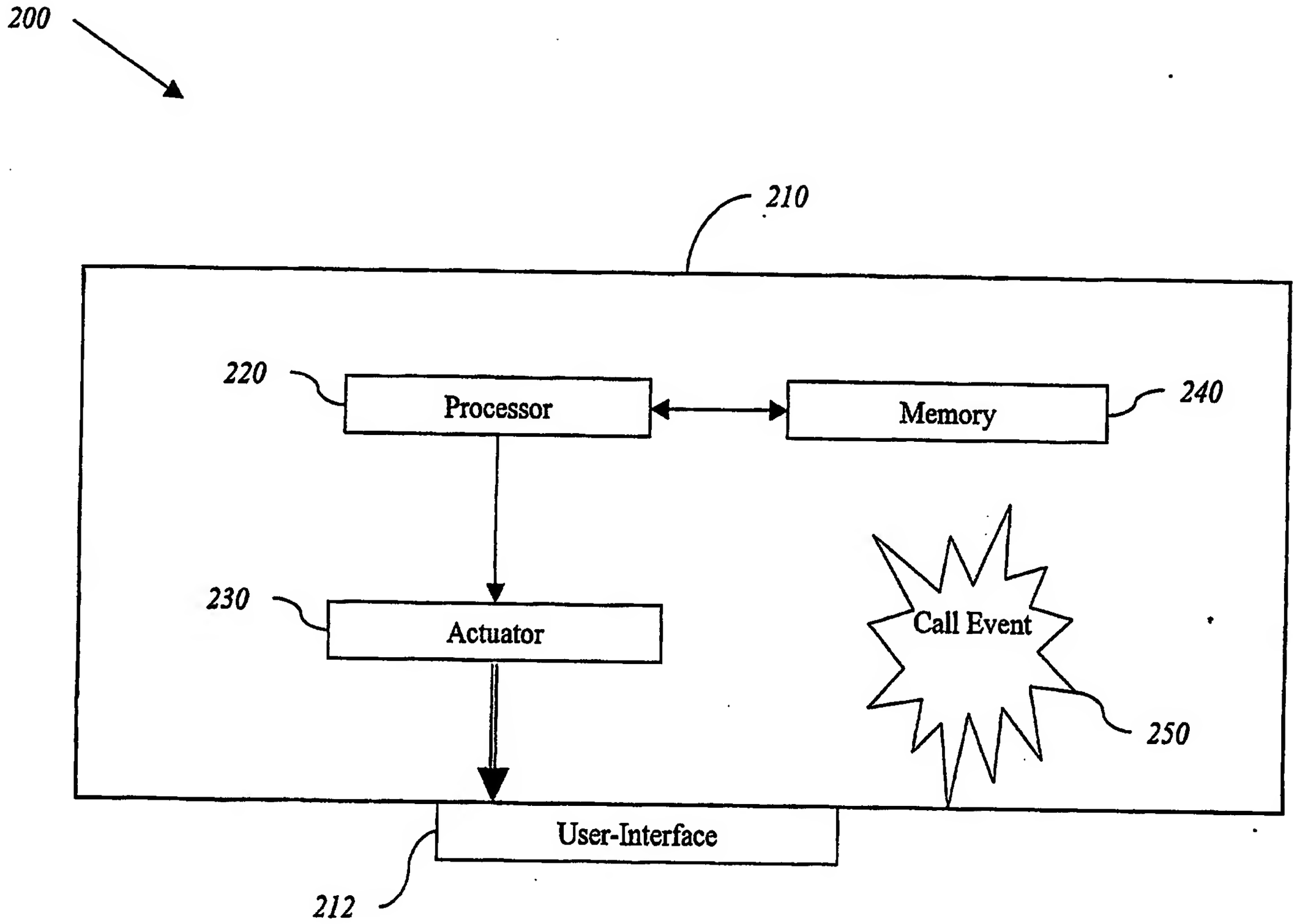
200
210
220
Processor
Memory
240
230
Actuator
Call Event
250
User-Interface
212

FIG. 2

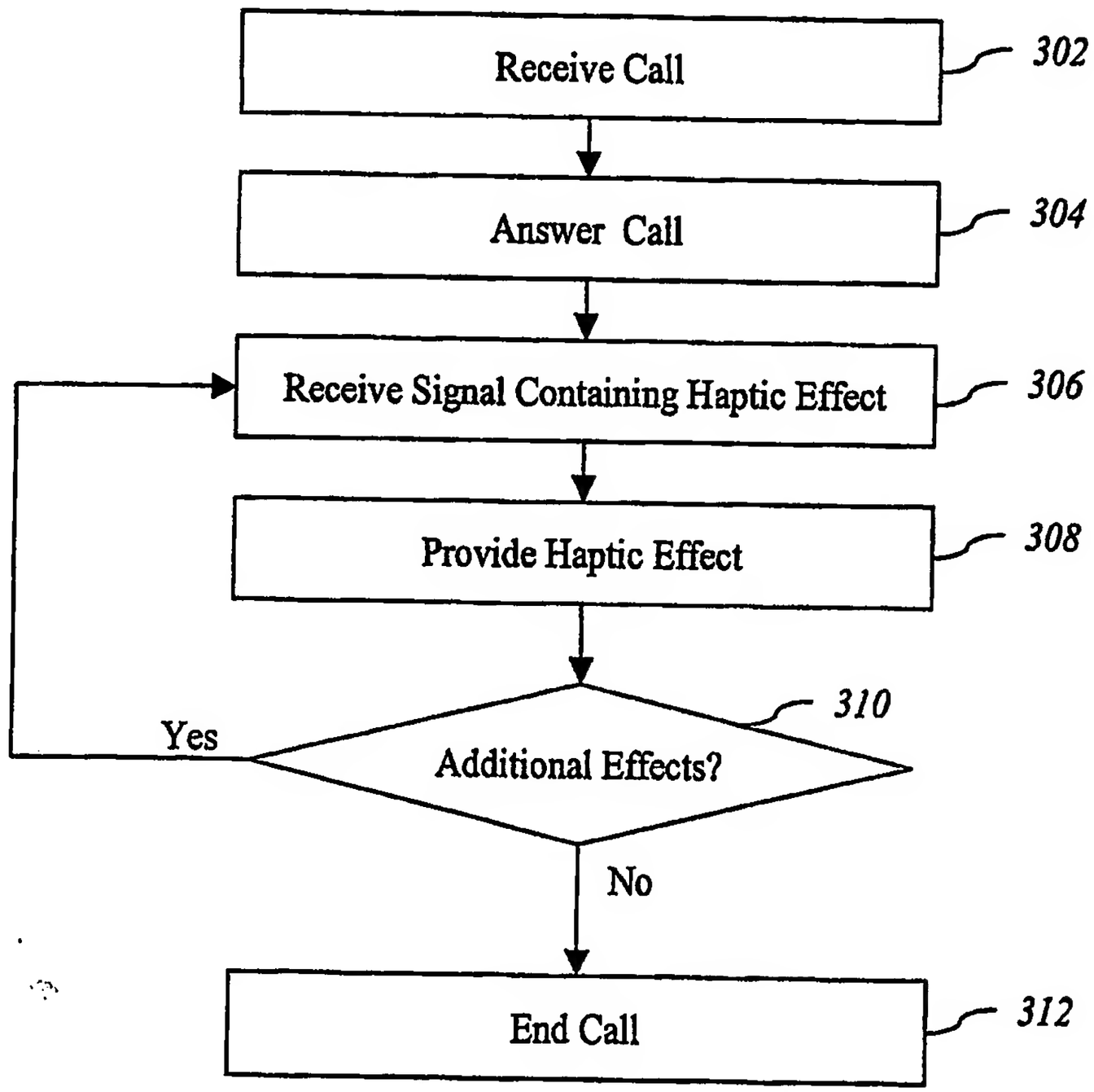
Receive Call
302
Answer Call
304
Receive Signal Containing Haptic Effect
306
Provide Haptic Effect
308
Additional Effects?
310
Yes
No
End Call
312

FIG. 3

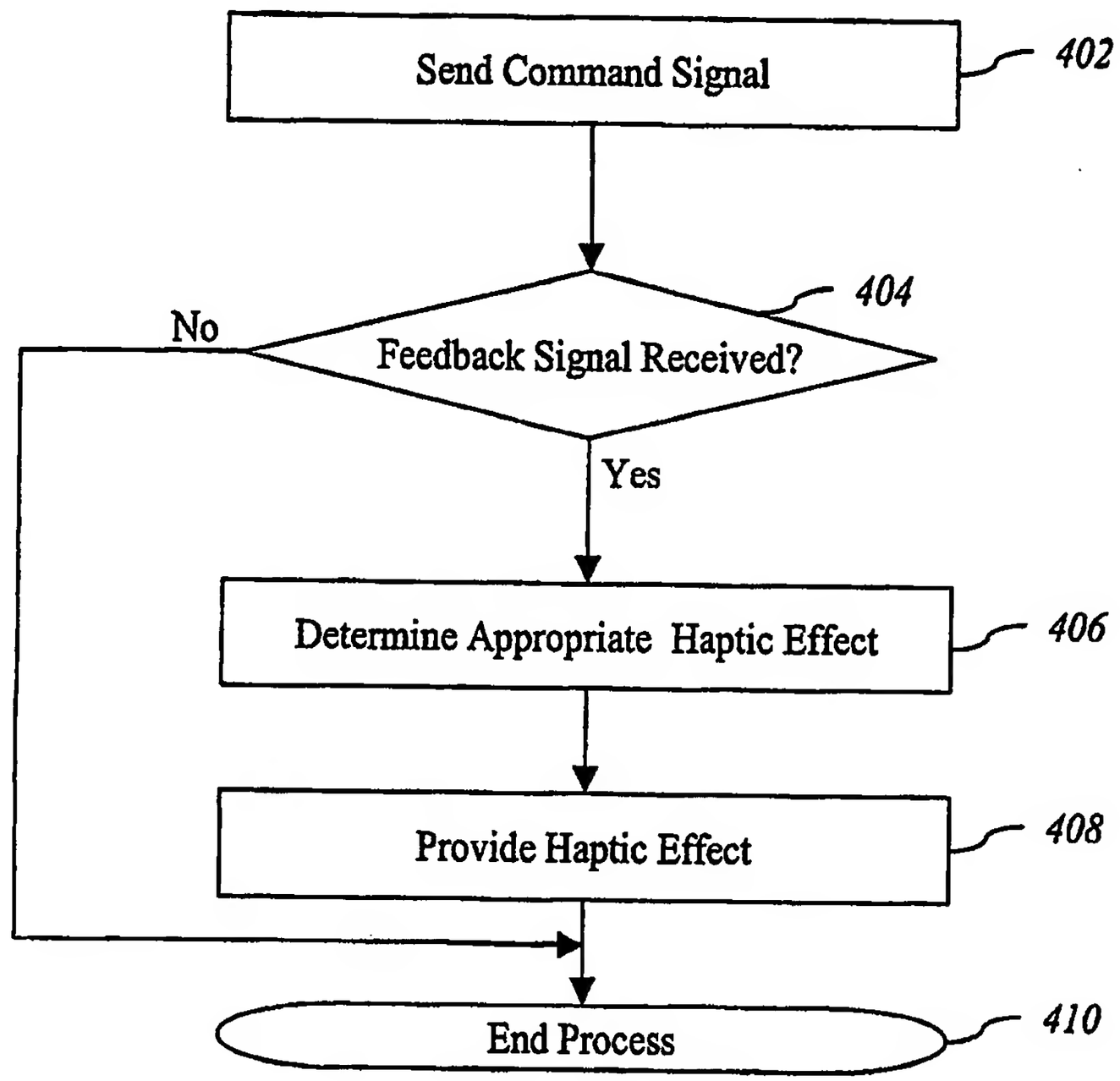
Send Command Signal
402
404
No
Feedback Signal Received?
Yes
Determine Appropriate Haptic Effect
406
Provide Haptic Effect
408
End Process
410

FIG. 4

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